SOIL SURVEY OF ADAMS COUNTY, PENNSYLVANIA.

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LOCATION AND BOUNDARIES OF THE AREA.

Adams County, Pa., lies along the Pennsylvania-Maryland line, about midway between the east and west boundaries of the State. It is, in general, rectangular, and thus not so irregular in outline as most of the counties in this part of Pennsylvania, and includes an area of 341,888 acres, or about 534 square miles. Gettysburg, the county seat, with a population in 1900 of 3,495, is the largest town.

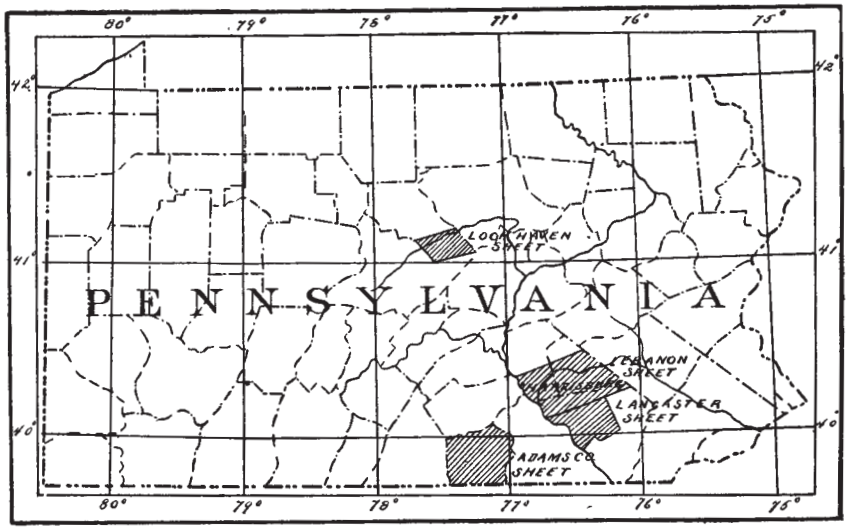

FIG. 3.—Sketch map showing location of the Adams County area, Pennsylvania.

Other important towns are New Oxford, Littlestown, Fairfield, Cashtown, and York Springs.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.[a]

Contention about the boundary line between the conflicting land grants of William Penn and Lord Baltimore made each of these proprietors anxious, the better to prove his claims, to inaugurate settlements in the area now included in Adams County.

[a] The historical facts included in this chapter are taken principally from Bates's History of Pennsylvania.

The first settlement was made in 1734 by the Germans, who were followed closely by the Scotch-Irish and the Jesuits. At that time the Delaware and Catawba Indians were at war, and while on their depredatory excursions frequently stopped at the settlements for quarters, but never inflicted any injury upon the inhabitants.

In 1739–40 the Penn estate laid out a reservation along Marsh Creek and called it the "Manor of Masque." This included all of the present township of Cumberland and the greater part of Freedom. Many Dutch settlers were coming at this time, and they settled within the limits of the "manor."

One of the early settlers of ability and resource was James Gettys, who had opened a farm, store, and country tavern at the Marsh Creek settlement. He soon conceived the idea of laying out a town on his land, deeded land to the county for various public uses, announced his intention to make this the future county seat, and offered inducements to settlers. As a result the name "Marsh Creek Settlement" was changed, in his honor, to Gettysburg, in 1780.

The clannishness and exclusiveness which had been so characteristic of the settlements of different nationalities largely disappeared with the necessity for banding together during the war of the revolution, and from that time dates the beginning of their intermingling.

The difficulty over the boundary between the Penn and Baltimore grants had been settled in 1767 by the determination of the Mason and Dixon line, with which the southern boundary of Adams County coincides.

Until the year 1800 Adams County was a part of the county of York, but the rapid settlement which took place, accompanied by the growing discontent at the distance from the county seat, led, in that year, to the erection of a separate county, which was named in honor of President Adams.

For many years there were no roads except some paths through the forests used for the trains of pack horses, on which all transportation to Baltimore and other markets was carried on. The owners of these pack-horse trains violently opposed the building of roads, but in the early part of the nineteenth century several turnpike toll roads were constructed leading from Gettysburg across the county.

The Scotch-Irish settled in the northern part of the county, but they were not as successful farmers as the Germans, who had settled in the southern part, and their farms were gradually acquired by the more steady Germans as they overspread the county.

Wheat, corn, oats, barley, and buckwheat were the principal crops. Small amounts of these products were hauled to Baltimore, but for the most part they were consumed at home, while hogs, sheep, and a few cows were sent to market.

CLIMATE.

Situated on the Mason and Dixon line, Adams County has a moderate climate, and escapes the temperature extremes of both the North and the South. Crops are seldom injured either by late frosts in the spring or early frosts in the fall.

The following table, taken from the report of the Pennsylvania secretary of internal affairs, shows the mean monthly and annual temperature and precipitation at Gettysburg, in so far as the records have been kept at that station:

Mean monthly and annual temperature and precipitation.

Month.	Gettysburg.									
	Temperature.				Precipitation.					
	1839-1865.	1889.	1890.	1895.	1839-1865.	1889.	1890.	1893.	1894.	1895.
	°F.	°F.	°F.	°F.	In.	In.	In.	In.	In.	In.
January	27.8	.....	39.1	.....	3.14	.....	2.25	2.04	1.56	.....
February	30.7	.....	37.8	.....	2.60	.....	4.51	3.46	3.89	.....
March	38.9	.....	.....	36.2	3.00	.....	4.66	2.24	1.21	1.88
April	49.9	.....	48.7	49.8	3.56	.....	3.31	5.20	3.94	3.27
May	60.8	.....	59.6	60.9	3.85	.....	8.10	7.36	6.84	3.16
June	69.8	.....	70.3	71.3	3.46	.....	3.91	3.26	1.78	3.10
July	73.8	.....	73.3	70.0	3.40	.....	2.78	1.18	1.47	1.37
August	71.3	.....	70.3	74.4	3.40	3.51	8.95	3.18	2.03	2.27
September	63.4	.....	.....	69.2	2.98	6.81	2.51	3.29	7.60	1.24
October	50.2	49.7	.....	47.9	3.03	4.16	.....	4.00	.....	2.13
November	40.0	40.0	.....	42.8	3.05	6.47	.....	2.97	.....	1.55
December	31.1	39.6	.....	33.4	3.43	2.01	.....	1.77	.....	2.37
Year	50.6	.....	.....	.....	38.90	.....	.....	39.95	.....	.....

The above records are so broken that the following complete records of temperature and precipitation, taken in the adjoining county of York, are also given:

Normal monthly and annual temperature and precipitation.

Month.	York, Pa.		Month.	York, Pa.	
	Temperature.	Precipitation.		Temperature.	Precipitation.
	° F.	Inches.		° F.	Inches.
January	28.7	2.45	August	73.3	4.16
February	27.9	3.91	September	66.4	3.76
March	40.0	3.25	October	54.1	3.04
April	50.5	2.87	November	43.0	3.23
May	61.9	4.10	December	32.6	3.29
June	70.5	3.11	Year	62.5	40.48
July	75.6	3.31			

PHYSIOGRAPHY AND GEOLOGY.[a]

The general direction of all the principal physiographic features of Adams County is from northeast to southwest. The east-central two-thirds of the entire county consists of a broad, moderately rolling valley, which has been dissected by one continuous trap dike that enters the county from Maryland and extends entirely across it; and another similar dike, which enters the county at the same place, extends northerly beyond Fairfield and then northeasterly in a direction generally parallel to the first. The latter dike is broken several times, and so, although its course may be traced in the field, it does not appear on the map because it has not come sufficiently near to the surface to effect a change in soil type.

Flanking this broad valley on the west and north lies the South Mountain Range. The approach to this mountain is in most places abrupt, and no less so is the corresponding change of soil types. The range is broken in several places by gaps, through which the roads run, and by one important longitudinal valley, known as Buchanan Valley. At the northwest corner of the county this range spreads into a small plateau called the "Big Flat." Besides the Green Ridge, which forms the most continuous and principal part of the range, there are many steep-sided hills and small mountains, some of which are almost conical shaped, but the majority of them are long and narrow and lie parallel to the main ridge.

The main broad rolling valley of the county already mentioned is bounded on the southeast by a slightly rolling limestone valley, of which the general level is somewhat lower than the preceding. Rising from this limestone valley, and occupying the southeast corner of the county, is a moderately rolling or hilly section formerly called "The Barrens." A small area, with topography similar to that of The Barrens, occupies the extreme eastern part of the county in Berwick Township.

The drainage of the county is accomplished by two main systems. In the northwestern part, the Conewago Creek has its source, and then extends easterly to Berlin in the northeastern part of the county, draining in its course most of the northern half, and by its confluence with the Little Conewago, the southeastern part of the county. This system is terminated on the south by a low divide, which has its inception midway between Arendtsville and Hilltown, extends southeasterly to a point about a mile south of Hunterstown, and thence in a more southerly course toward Littlestown. That part of the county

[a] Much of the geological data contained in this report was obtained from Prof. E. S. Bridenbaugh.

south and west of the divide is drained by a separate system, of which the chief branches are Rock and Marsh creeks, but these streams do not join until after leaving Adams County.

Six geological divisions are represented in Adams County. Of these the most extensive is the Mesozoic (Triassic) sandstone and shale, which give rise to the soils of the Penn series. These formations, once level or but gently rolling, have been dissected by streams to greater or lesser extent, depending upon the resisting powers of the underlying rock. The valleys are usually narrow, and where their slopes are steep the underlying ledges of shale are often exposed. The principal rock of the intrusive trap dikes found in these formations is syenite, from which the soils of the Cecil series are principally derived. The intrusion of these dikes has caused varying degrees of metamorphism of the red shale and sandstone and the resulting change in color from red to blue. Sometimes the intrusive dike has failed to protrude through the surface, but approaches near to it. An example of this may be seen in the Heidlersburg road about 1 mile north by northeast of Gettysburg, just before reaching the Rock Creek bridge. Here the underlying dike comes within 6 inches of the surface, as can be seen in the small quarry where road material has been loosened by blasting. Numerous instances of this kind, varying in the distance from the surface or the degree of intrusion, occur throughout the Mesozoic formations. In the vicinity of Biglerville there are several instances where shale was deposited after the time of the intrusion of these masses as well as before.

The South Mountain Range consists of Archean rocks, chiefly gneiss. These rocks, together with the Potsdam, which is represented by considerable outcrops along the base of the South Mountain, and also in Pigeon Hills, in Berwick Township, give rise to the soils of the Porters and Dekalb series.

The limestone of the county, which is in the main blue, but contains varying amounts of impurities in the form of quartz, is Siluro-Cambrian in age, as is also the hydromica schist. Of these, the former give rise to the Hagerstown series of soils, while the latter, together with the small area of chlorite schist that occurs in the extreme southeast corner of the area, has been mapped as Cecil loam. The age to which the chlorite schist belongs has not as yet been definitely settled by geologists.

SOILS.

There are fourteen types of soil in Adams County. The actual and relative extent of each of these is shown in the following table:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Penn shale loam	100,032	29.3	Cecil loam	8,448	2.5
Penn loam	54,592	15.9	Dekalb stony loam	4,224	1.2
Porters stony loam	41,472	12.1	Meadow	3,648	1.0
Cecil clay loam	40,960	12.0	Penn sandy loam	3,392	1.0
Rough stony land	30,976	9.1	Hagerstown stony loam	1,408	.4
Porters clay	27,264	8.0	Cardiff slate loam	768	.2
Hagerstown loam	16,064	4.7	Total	341,888	
Cecil stony loam	8,640	2.5			

PENN SHALE LOAM.

The surface soil of the Penn shale loam consists of dark indian-red loam from 8 to 10 inches deep. This material is generally uniform in texture and its slight variations are due chiefly to the effects of the washings to which the type in some degree is susceptible. The subsoil consists of heavy indian-red loam, silty loam, clay loam, or loam grading into clay loam. The depth of this subsoil is most variable, as it always rests upon the shale rock from which it is derived, and the distance of this rock from the surface depends largely upon the local topography. Where level areas of considerable size occur the soil is often 3 feet deep, and at the foot of slopes it is usually deeper than that, but wherever the surface is very much broken it is seldom possible to bore below 12 to 18 inches, except in the hollows and along the bases of slopes.

From 10 to 40 per cent of shale fragments occur in the surface soil, and the quantity always increases in the subsoil until it is impossible to bore at depths ranging from 12 to 36 inches. This mass of shale fragments immediately overlies the parent shale rock to a depth of several inches, and the general statement may be safely made that the greater the quantity of shale fragments at the surface the nearer is the underlying rock. On steep slopes and bluffs along stream courses, where the soil erodes away as fast as formed, ledges and low cliffs of red shale are often exposed and their outer surfaces present the various stages of the disintegration of this rock into fragments.

The Penn shale loam includes one important variation. On each side of the long intrusive dike which, in crossing the county from northeast to southwest, passes just south of Gettysburg, the surface soil to a depth of 10 inches is a heavy blue or gray loam, which often

contains a relatively high percentage of silt. The subsoil is blue or gray heavy silty loam or clay loam. Fragments of blue shale, ranging in amount from 10 to 40 per cent, occur in both soil and subsoil, and this has given it the local name of "blue gravel land," in distinction from "red gravel land," which is the local designation of the main type. Several similar occurrences of the blue gravel phase, though of lesser extent, are scattered about the county.

The Penn shale loam is the most extensive soil type of Adams County. It occurs as a broad rolling valley, which extends across the central part of the county parallel to the South Mountain Range. The prevailing gentle surface features of this valley are sharply broken by two long intrusive dikes, which give rise to soils of the Cecil series, and are rendered more steeply rolling in several sections by the intrusion of dikes of the same material which have failed to penetrate the surface, though in several instances they are but from 1 to 2 feet below it, and have consequently caused many local variations in the metamorphism of the shale.

The drainage features of the Penn shale loam depend entirely upon its topography, because the underlying beds of shale prevent the downward percolation of water to any great depth below the surface. This fact determines in great measure the crop yields and the consequent values of the soil, for its producing power depends largely upon the caprice of the seasons. In wet years considerable areas are continually wet and clammy because the excess of moisture can escape only in a lateral direction. On areas nearly level such water movement is slight, but the lower portions of slopes are kept so wet from this source in rainy seasons as to injure crops seriously, and such areas are locally termed "spouty land." The underlying shale, however, is often vertically fractured to greater or lesser extent, and thus provides for the removal of excess moisture. The type suffers even more from drought than from rainy seasons, because the shallow subsoil can retain but a small reserve supply of moisture, and when this becomes exhausted crops must succumb. In seasons when a normal amount of rainfall is evenly distributed the Penn shale loam is a safe soil and good crops are produced.

The type is derived from the beds of shale which underlie it, excepting only the lower slopes and hollows where the soil has been augmented in varying degree by the washings from higher elevations. The blue shale phase and the similar local variations above mentioned are derived from beds of shale which have been metamorphosed in varying degree, as described under "Physiography and geology."

The Penn shale loam is used for the general system of farming which obtains throughout the area, and is better adapted to this purpose than to the production of any special crop. Corn often suffers

more from drought than do the cereal grains, because the latter are harvested in many seasons before dry weather has serious effect.

The relative crop value of the "red gravel land" and the "blue gravel land" is a much mooted question. The opinion is frequently advanced that one surpasses the other, but either proposition doubtless holds true only for limited sections, and then depends chiefly upon the distance of the underlying shale from the surface.

The average yield of wheat is 15 bushels; oats, 30 bushels; shelled corn, 25 bushels, and hay, 1½ tons per acre.

The results of mechanical analyses of the fine earth of both soil and subsoil are given in the following table:

Mechanical analyses of Penn shale loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	*P. ct*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
1235	3 miles E. of Gettysburg.	Red medium loam, 0 to 10 inches.	3.6	7.9	3.7	9.0	6.8	43.7	25.2
11626	2 miles N. of Hunterstown.	Brown heavy loam, 0 to 8 inches.	12.3	23.0	6.4	9.1	4.6	15.1	29.3
11624	3 miles N. of New Oxford.	Red clay loam, 0 to 8 inches.	3.1	5.1	1.2	1.8	3.7	47.9	36.8
11627	Subsoil of 11626	Red clay loam, 8 to 36 inches.	12.5	12.1	2.9	4.2	3.3	34.2	30.8
11236	Subsoil of 11235	Red heavy clay, 10 to 36 inches.	3.8	9.3	5.2	9.3	8.2	23.6	40.3
11625	Subsoil of 11624	Red clay, 8 to 30 inches	10.7	11.2	2.7	4.1	4.4	15.4	51.5

PENN LOAM.

The surface soil of the Penn loam consists of dull-red or brown silty loam from 8 to 12 inches deep. The subsoil consists of heavy indian-red or light-brown loam, which grades into red clay loam at depths ranging from 15 to 36 or more inches. In the vicinity of New Oxford the surface soil is a fine, very mellow loam, sometimes distinctly silty in character, which becomes quite compact at a depth of from 18 to 24 inches, and the underlying red clay loam is usually from 3 to 4 feet below the surface. Sandstone fragments to the extent of from 5 to 25 per cent are a frequent feature on the surface, as well as throughout soil and subsoil, but their occurrence is not constant. When the type is derived from the soft shales, fragments of that material ranging in amount from a trace to 10 per cent may be found in both soil and subsoil.

A stony phase occurs a short distance from Conewago Creek, southwest of Biglerville. The stones are principally quartz and hardened sandstone, with occasional soft sandstone fragments, though rounded

quartz pebbles, left from the decomposition of sandstone conglomerate, are found in a few localities. The Penn loam is frequently marked by knolls and ridges of Penn sandy loam. Such areas are most numerous in the eastern part of the county, but they are rarely of sufficient extent to appear on the map.

The Penn loam occurs in a large area which extends from Berlin southwest to the Maryland line, a distance of nearly 20 miles; also in a long, irregular area from Cashtown through York Springs to the county line, and in a detached area near Newchester.

The topographic features of the type are those of a broad, gently rolling valley, bounded in part by the more broken Penn shale loam and in part by the intrusive dikes of the Cecil series.

The soil is generally well drained. Small areas adjacent to streams are sometimes overflowed, and scattered minor depressions need artificial drains. In several instances tile drains have been constructed in such areas.

The Penn loam is derived from the underlying beds of Mesozoic soft sandstone and shale, but the processes of disintegration and decomposition have taken place to such degree that at present these rocks are so deeply buried beneath the surface as to have practically no effect upon the soil and its productivity.

The Penn loam is adapted to the general farm crops which are grown upon it, and as it is much less susceptible to drought than the Penn shale loam it far surpasses the average of that type in the production of corn and is somewhat superior for the small grains and hay.

Corn yields an average crop of 35 bushels, wheat 18 bushels, oats 35 bushels, and hay 1½ tons per acre.

The following table shows the results of mechanical analyses of the fine earth of soil and subsoil of this type:

Mechanical analyses of Penn loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
11616	1¼ miles NW. of Center Mills.	Red silty loam, 0 to 10 inches.	4.2	7.2	3.1	8.3	12.0	48.4	16.8
11618	1 mile N. of York Springs.	Red silty clay loam, 0 to 10 inches.	2.3	3.2	.8	1.5	6.6	58.2	27.1
11617	Subsoil of 11616	Loam to clay loam, 10 to 36 inches.	3.5	8.1	2.4	5.3	10.6	46.4	23.7
11619	Subsoil of 11618	Loam to clay loam, 10 to 36 inches.	2.8	4.7	1.2	1.9	7.2	53.8	27.9

PENN SANDY LOAM.

The surface soil of the Penn sandy loam consists of light, medium, or heavy sandy loam, which ranges from coarse to fine in texture, from 6 to 15 inches deep. Its color is brown, indian red, or, rarely, yellow. From 10 to 30 per cent of sandstone fragments are not uncommon, but these are not a constant feature. The subsoil consists of a variety of materials, but is usually a loam or silt loam. Frequently, however, the underlying sandstone is reached by the auger, and in this case, or where the sandstone bed rock is but 4 feet or so below the surface, the subsoil is often a sandy loam, which grades into sand as the rock is approached. In such case, which most often occurs on sharp slopes or on the crest of narrow ridges, the amount of sandstone fragments increases with depth, and for several inches above the parent rock a mixture of rock fragments and sand is found.

The principal area of the Penn sandy loam extends from near Littlestown southwest to the Pennsylvania-Maryland line. There its surface features are much varied, and it occupies hills, gentle slopes, and valleys alike. There is no regularity in its occurrence save in the area just mentioned. It is generally associated with the Penn loam, where it is found in many detached areas in every physiographic position of a moderately rolling country.

The Penn sandy loam is well drained, and crops sometimes suffer from lack of moisture late in the summer, but this seldom happens before the wheat and hay have been harvested.

The type is derived from Mesozoic sandstones and sandy shales.

The general farm crops of the area are grown upon this soil. Corn yields from 25 to 65 bushels of shelled grain, wheat from 12 to 25 bushels, oats 30 to 55 bushels, rye 15 to 30 bushels, and hay from 1 to 2 tons per acre. The type is well adapted to potatoes and early garden produce.

The following table shows the results of mechanical analyses of the fine earth of soil and subsoil of the Penn sandy loam:

Mechanical analyses of Penn sandy loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
11612	1¼ miles NW. of Littlestown.	Medium sandy loam, 0 to 8 inches.	3.1	14.4	11.2	31.5	8.7	14.7	16.3
11614	3 miles SW. of Littlestown.	Brown sandy loam, 0 to 10 inches.	1.5	9.2	9.1	22.7	12.5	27.3	17.4
11615	Subsoil of 11614	Brown medium loam, 10 to 36 inches.	2.9	7.1	6.1	18.0	13.6	32.5	19.8
11613	Subsoil of 11612	Sandy loam to sand, 8 to 36 inches.	2.2	7.8	9.7	35.4	10.7	14.3	19.5

CECIL CLAY LOAM.

The surface soil of the Cecil clay loam to an average depth of 10 inches consists of reddish-yellow or light-brown clay loam. The subsoil consists of reddish-yellow or light-brown clay loam grading into a clay in its lower depths. The subsoil often contains a considerable amount of particles of the disintegrated rock from which the type is derived. This character of material may extend to a depth of 36 inches or more, but frequently the clay content decreases below 30 inches, and the amount of disintegrated rock particles increases until the underlying mass of stones and rocks is reached. From 10 to 30 per cent of stones and bowlders, principally syenite, are commonly present in both soil and subsoil, and spots are not infrequent which are very stony; but, in general, the amount of stones is not sufficient to interfere seriously with cultivation.

The Cecil clay loam as mapped presents a variation which, though usually small in extent, occurs in numerous instances. In nearly all parts of the county where this type has been mapped it includes areas of clay underlain by a stiff heavy clay. Such areas would have been mapped as Cecil clay had their extent warranted it. There is no regularity in the occurrence of these areas, and they are likely to be found in any topographic position which the entire type includes.

Local areas of this soil are often incorrectly classed by farmers as sandy loam in distinction from the heavier phases of the type. This is due probably to the presence of small amounts of coarse, sharp sand—disintegrated particles of syenite—which in places gives to the soil a gritty feel. The presence of such particles is misleading, as they are insufficient in amount even to constitute a light phase of the type. From 10 to 30 per cent of stones are found on small areas of this type, and also occasional bowlders.

The Cecil clay loam occurs in long strips, which extend entirely or partially across the central part of the county from northeast to southwest. This position and the topographic features of the type depend directly upon the nature of the geological formation from which the soil is derived. This formation has already been described under " Physiography and geology." The surface features of the type range from moderately to steeply rolling, with but small areas of level land. It usually occupies entire dikes or the lower slopes of dikes of which the upper and steeper slopes and the summits are occupied by the Cecil stony loam, or Rough stony land.

Surface drainage is rapid with such topographic features, and small gullies are sometimes formed. Soil transportation steadily takes place, where gullies are not formed to an appreciable extent, and consequently the soil, as a rule, is much deeper on the lower and more gentle slopes than on the upper slopes and the summits of the

hills and ridges. The heavy character of the subsoil makes it retentive of moisture, and this enables the type to withstand drought much more successfully than soils of the Penn series.

The Cecil clay loam has been derived chiefly from syenite, which is the principal rock of which the intrusive dikes are composed, but in some localities other metamorphic rocks have played some part in its formation.

The greater part of the Cecil clay loam is cleared and cultivated, but the roughest sections are used as permanent pasture, or left in forest, which includes all the common hardwood varieties.

The Cecil clay loam is a good corn soil, and is much safer for that crop than the Penn shale loam, because it is much less susceptible to drought, though in favorable seasons there is little difference in yields. Good crops of wheat, oats, rye, and hay are also grown.

The average crop yields are estimated as follows: Corn, 30 bushels; wheat, 15 bushels; oats, 30 bushels, and hay, 1½ tons per acre.

The results of mechanical analyses of the fine earth of both soil and subsoil are given in the following table:

Mechanical analyses of Cecil clay loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
11582	2 miles S. of Mummasburg.	Brown clay loam, 0 to 8 inches.	1.4	4.2	2.0	4.7	5.1	49.7	32.8
11580	3 miles SW. of Heidlersburg.	Brown clay loam, 0 to 10 inches.	2.2	4.1	1.4	3.0	4.7	48.7	35.4
11583	Subsoil of 11582	Clay loam to clay, 8 to 36 inches.	4.1	11.5	4.0	9.2	5.4	33.6	32.1
11581	Subsoil of 11580	Clay, 10 to 36 inches	1.3	2.2	.8	1.8	2.6	41.2	50.2

CECIL STONY LOAM.

The surface soil of the Cecil stony loam to an average depth of 10 inches consists of heavy red loam or clay loam. The subsoil consists of light-red clay loam or clay, which usually grades heavier in texture with increasing distance from the surface, but in places it begins to grow lighter at a depth of 30 inches, and grades gradually into a mass of disintegrated syenitic rock. Both soil and subsoil contain from 30 to 60 per cent of stones and bowlders. Where not too numerous, the bowlders, which are mostly syenite and range from 1 to 3 feet in diameter, have been removed and utilized in the construction of fences about the fields. The small stones are largely

"ironstones," and many large heaps of these are seen along the fields from which they have been picked.

The Cecil stony loam occurs in small areas on the intrusive dikes which have cut across the county.

The topographic features of the Cecil stony loam are always more or less broken and hilly. The type often occupies the steep slopes at lower elevations than the Rough stony land, and includes entire hills and ridges where that type is lacking or too small to appear on the map.

Surface drainage is so rapid, on account of the physiographic features of the type, that washing often takes place on the cultivated fields. The subsoil is so retentive of moisture, however, that the type seldom suffers from drought. The Cecil stony loam is derived from syenite, and also in slight degree from the other metamorphic rocks of the intrusive dikes. A large part of the type is covered with forest growth, which consists largely of oak, with lesser amounts of chestnut and locust.

The least stony parts of the Cecil stony loam are adapted to the general farm crops of the area that are grown upon them, but the fields are so small and irregular that it is hardly possible to give accurate estimates of crop yields, and the same feature lessens, in varying degree, the desirability of using the soil for cultivated crops. The least stony areas are well suited to the growing of apples, and where well drained offer good opportunities for the profitable development of this industry. The areas unsuited to the above uses can best serve as pasture or woodland.

The following table shows the results of mechanical analyses of the fine earth of soil and subsoil of this type:

Mechanical analyses of Cecil stony loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
11578	3 miles NE. of Fairfield.	Brown heavy loam, 0 to 7 inches.	4.7	16.4	4.7	10.3	9.5	29.1	25.1
11579	Subsoil of 11578.....	Loam to clay loam, 7 to 36 inches.	5.9	21.5	6.6	11.5	9.8	20.1	24.6

HAGERSTOWN LOAM.

The surface soil of the Hagerstown loam consists of mellow loam or silty loam, from 8 to 12 inches deep, ranging in color from brown

to dark yellow. The immediate subsoil consists of silty loam, slightly heavier and more compact than the soil. Its color is deep yellow, often marked with a tinge of red which gradually becomes more pronounced until, in the lower subsoil, it is deep red. This change in color takes place generally from 2 to 4 feet beneath the surface, and coincident with it the subsoil grades into a stiff clay. The type is remarkably uniform in texture, the chief variation occurring along the foot of the slopes, where the mellow loam has accumulated and the stiffer red clay loam thus lies at a greater depth. The type is free from stones with the exception of fragments of chert. These may be absent, but usually they are found to the extent of from 5 to 25 per cent in both soil and subsoil, being greatest in amount on the low hills and ridges, where the subsoil generally contains a greater proportion than the soil, although the proportion is sometimes reversed. These fragments range in size from mere particles to 3 or 4 inches in diameter, but the greater part of them are from 1 to 2 inches. A local variation of the type occurs about 1 mile east from Fairfield, where a heavy clay loam soil is underlain by heavy plastic clay. If of sufficient extent, this would have been mapped as Hagerstown clay.

The Hagerstown loam is found in two parts of the county widely separated. The most important area is in the southeastern part, where it extends from Littlestown northeasterly to the county line, including most of the Conewago Valley. Another considerable area which occurs at Fairfield extends both north and south from that point, growing gradually narrower until terminated by the surrounding hills. Scattered areas are also found in the vicinity of Cashtown, where they are associated with the larger bodies of Hagerstown stony loam.

The Hagerstown loam, although it occupies shallow valleys and is less hilly than most of the surrounding soil types, does not include large level areas, but, as a rule, is moderately rolling. The most hilly parts occur along its boundaries with other types.

Such physiographic features make for this soil drainage conditions generally adequate, but some of the lowest-lying portions of the type have been much improved by tile drains.

The Hagerstown loam is derived from the massive blue limestone formation of Cambrian-Silurian times. The bed rock sometimes protrudes through the surface, but usually it is covered with soil from 3 to 20 or more feet deep. The limestone contains considerable impurity in the form of veins of quartz, which give rise to the principal parts of the fragments found in this soil. The limestone is quarried and burned at numerous places where it comes near enough to the surface for economical working. The burned lime is applied to the land, and is extensively used for this purpose in the immediate locality of its production, as an occasional heavy application of it,

especially in connection with barnyard manure, is considered very profitable.

The Hagerstown loam is an excellent soil for the production of all general farm crops. The most rolling parts are well adapted also to apple growing, but the soil is held in such high esteem for general farming that orchards are seldom planted upon it.

The principal crops grown and the average yield of each are: Wheat, 21 bushels; shelled corn, 50 bushels; oats, 30 bushels, and hay, 1½ tons per acre, though much higher yields are obtained in favorable seasons.

The following table shows the results of mechanical analyses of the fine earth of both soil and subsoil of this type:

Mechanical analyses of Hagerstown loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
11598	2 miles NE. of Littlestown.	Brown clay loam, 0 to 10 inches.	2.2	3.0	1.3	2.3	5.1	52.2	33.8
11600	¼ mile NE. of Littlestown.	Brown clay loam, 0 to 12 inches.	4.2	4.6	1.5	3.4	5.6	37.9	42.7
11601	Subsoil of 11600	Silty clay, 12 to 36 inches.	5.8	5.9	1.7	3.8	4.0	35.0	43.7
11599	Subsoil of 11598	Yellow clay, 10 to 36 inches.	.8	1.1	.4	1.5	7.6	35.3	53.2

HAGERSTOWN STONY LOAM.

The surface soil of the Hagerstown stony loam consists of medium brown loam 8 inches deep. Occasionally the content of fine sand is sufficient to give the soil the character of a fine loam, but such areas are of small extent. The subsoil consists of heavy yellow loam, which grades into clay loam at an average depth of 30 inches. The amount of stones present in both soil and subsoil varies greatly. From 25 to 40 per cent of chert, quartzite, and hardened sandstone are commonly found, and the amount is greater than this on local patches. The Hagerstown stony loam occupies but a few small areas in Adams County, the largest and most important of which is at Cashtown. A few scattered areas also occur near Fairfield. The type is moderately rolling and is generally well drained.

The Hagerstown stony loam is derived from a cherty form of limestone, and the principal part of the stone content of the soil consists of fragments of chert which were originally embedded in the parent limestone rock.

On lower slopes the texture of the soil has been affected slightly by material washed from other soil formations which occur at higher elevations, and the character of the stones on the surface near such boundaries varies somewhat.

The Hagerstown stony loam, where the topography is such as to secure good drainage, is best adapted to the production of apples and peaches. Where not too stony, the type is also well adapted to general farm crops, producing yields only a little below those obtained on the Hagerstown loam.

The following table shows the results of mechanical analyses of the fine earth of both soil and subsoil of this type:

Mechanical analyses of Hagerstown stony loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
11596	½ mile NE. of Cashtown.	Brown loam, 0 to 8 inches.	3.4	6.4	2.9	4.6	7 5	50.5	24.7
11597	Subsoil of 11596	Heavy yellow loam to clay loam, 8 to 36 inches.	4.1	7.2	3.0	5.0	6.0	45.8	28.7

CECIL LOAM.

The surface soil of the Cecil loam to an average depth of 8 inches consists of medium light-brown loam, often containing a relatively high percentage of silt. This material is always mellow, and when not well moistened by rain it becomes light and fluffy. The subsoil consists of heavier loam than the soil, and with increasing depth the color grades from light brown to pale red or yellow. The subsoil contains varying amounts of mica particles, but always enough to give it the greasy feel characteristic of soils derived from rocks which carry a high percentage of mica. Finely divided mica scales are usually found in the surface soil also, but in much smaller quantities. Small areas of the type are free from stones, but generally rock fragments, ranging in diameter from 1 to 6 inches, are present. With the exception of a few isolated patches, however, these fragments are insufficient in amount seriously to interfere with tillage. They are greatest in quantity on the steepest of the hills and knobs, where the average amount is about 40 per cent. In such positions the soils show a slight tendency to wash, and the finer particles have been accumulated to some extent in the little hollows, giving to the soils there the texture of heavy loams, while the resulting soils on the elevations are

correspondingly coarser in texture and approach in a few minor instances heavy sandy loams. On the surface of the low-lying places the amount of stones is seldom as much as 10 per cent, but the subsoil often is as stony as on the hills. Throughout the formation the content of rock fragments increases below a depth of from 1 to 2 feet, and occasionally a mass of partially decomposed schist and loose stones is found at 30 inches or below.

The chief part of the area occupied by Cecil loam is moderately rolling to hilly. Gentle slopes of considerable extent are common, but there are also numerous low, steep hills and knolls which give the type a much varied aspect.

The many minor streams resulting from the irregular surface features of this formation secure for it ample drainage, except in a few small hollows shut in by surrounding hills.

The Cecil loam is derived chiefly from mica schist and chlorite schist rocks. The latter predominate in the extreme southeast corner of the area, and are bordered on the north by a preponderance of the former, but they are much intermixed, and the soil resulting from their decay is very uniform. Other scattering crystalline rocks have had but minor influence on the formation of this soil.

The occurrence of the Cardiff slate loam, with its underlying slate quarries, along the border of this type probably explains why the entire Cecil loam formation with its fragments of mica schist is often spoken of locally as a slaty soil.

About three-fourths of the type is tilled, the most stony and hilly parts being left in forest. The trees are largely chestnut, and for this reason the type is often designated " chestnut land."

When the area occupied by the Cecil loam was first settled—about the year 1739—the ground was almost destitute of large timber, and for this reason it received the name " Barrens," which name it has since retained. This treeless condition was caused, it is said, by the burning of the undergrowth every few years by the Indians. After white settlers came the conflagrations ceased, and in the course of time the tract became well timbered with chestnut, oak, and hickory. The section was but sparsely settled, however, for a long time. It was generally considered unproductive, and with the exception of small areas around the scattered buildings it was uncleared. The development of this section has taken place mostly within the last decade, and crops during the present season, which compare favorably with those of the limestone valley, make it seem strange that this section should have remained unpopular for so long. The soil is warm and can be worked earlier in the spring than the heavier soils.

At the present time the farms are generally well kept and tidy. Good crops of corn, wheat, rye, and hay are obtained, and in the wet

seasons the yields are not below those of the more popular soils. Oats, on account of rust, are no longer grown to any extent.

Many small peach orchards are found on the Cecil loam, and it would seem that their culture might well be extended. The soil can be bought, with improvements, at an average price of $40 an acre, and, considering the much higher prices of the surrounding soils, offers to intelligent farmers good opportunities either for special or general farming.

The following table shows the results of mechanical analyses of the fine earth of soil and subsoil of this type:

Mechanical analyses of Cecil loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
11588	2 miles S. of Littlestown.	Heavy silty loam, 0 to 9 inches.	1.4	3.5	3.7	2.4	4.2	55.7	28.9
11590	4 miles SE. of Littlestown.	Heavy clay loam, 0 to 8 inches.	4.5	4.1	1.7	4.0	5.8	39.8	39.7
11589	Subsoil of 11588	Clay loam, 9 to 36 inches.	4.0	6.6	2.1	4.9	4.8	47.8	29.6
11591	Subsoil of 11590	Heavy clay loam, 8 to 36 inches.	8.8	5.5	3.2	6.8	5.2	33.1	37.6

CARDIFF SLATE LOAM.

The surface soil of the Cardiff slate loam, to a depth of from 8 to 12 inches, consists of heavy fine loam to clay loam, which varies in color from blue to gray. Slate fragments from 4 to 8 inches long are not uncommon, and the surface soil contains from 10 to 40 per cent of slate particles and small fragments. The subsoil consists of a silty clay loam, grading into light clay, but usually the small fragments of slate are so numerous that it is impossible to bore below 15 or 20 inches, and at a depth of 3 feet or more this mass of broken slate rests upon bed rock. This rock, for the most part, is steeply inclined, and thus its cleavage prevents the too rapid drainage which would follow if its flat surface were uppermost.

The Cardiff slate loam occupies a long, narrow ridge in the Conewago Valley, where it leads toward the Pigeon Hills, and also a border area between that valley and the Cecil loam formation south of it. In the former position it represents an intrusive dike, and in the latter it is derived from similar slate rock, which outcrops along

the northern border of the Cecil loam beneath the more metamorphosed mica schist of that formation.

Fair yields of corn, wheat, oats, and rye are obtained from this soil. Its position is such that not all of it is tilled. Peaches and apples do well and the more stony places might profitably be devoted to these crops.

The following table shows the results of mechanical analyses of the fine earth of soil and subsoil of this type:

Mechanical analyses of Cardiff slate loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
11576	2 miles SE. of McSherrystown.	Clay loam, 0 to 10 inches	2.3	1.6	0.5	2.0	15.3	42.8	35.5
11577	Subsoil of 11576	Clay, 10 to 36 inches	2.1	1.5	.6	2.3	8.9	39.0	45.6

PORTERS CLAY.

The surface soil of Porters clay consists of heavy loam or clay loam, brown or dark gray in color, from 6 to 15 inches deep. The subsoil consists of pale-red or light-brown clay loam or clay. From 15 to 25 per cent of stones and angular rock fragments are usually present in both soil and subsoil, but they are never of sufficient size materially to impede cultivation. The distribution of the stones is very irregular. Usually they are most numerous on low hilltops and steep slopes, while there are few or none on gentle slopes; but in other cases their amount seems to bear no relation whatever to topography.

The Porters clay is found in Adams County in the South Mountain Range and along its lower slopes to the east and south, and also in the Pigeon Hills in Berwick Township. The largest area lies in the extreme northern part of the county, where the South Mountain Range passes into Cumberland County. Here its topographic features are moderately rolling, and although level areas of more than a few acres in extent are seldom seen, yet little of the type is so steep as to be troublesome in working or to impair very much its agricultural value. In the mountains this soil is found in the valleys and coves. Where these are broad and the slopes to the surrounding mountains are only moderately rolling for some distance the type occurs in considerable areas; but where they are narrow it is found

only in small areas or is displaced altogether by the Porters stony loam.

The surface drainage secured by the physiographic features just described is ample for most of the type. Small, and consequently unimportant, level areas adjacent to the streams which drain the main valleys in the mountains are so wet as to be swampy; and, on the other hand, small gullies are sometimes formed on the steepest slopes by surface washing.

The Porters clay is derived from the rocks of Archean age, of which the South Mountains are composed—chiefly gneiss, orthofelsite, and quartzite. Along the east and south slopes of the South Mountain range, and just along the line of contact between the Archean rocks of that formation and the Mesozoic rocks which lie below it, are the most important areas of the Porters clay. Certain parts of these areas, seldom large, are derived principally from the rock locally known as "copperstone." These areas, popularly termed "copperstone land," are more productive than the general type, and are considered nearly equal in fertility to the limestone soils.

The Porters clay of the mountain areas is fairly well adapted to general farm crops, and where the type is sufficiently rolling to have adequate drainage it is well adapted to the production of apples and peaches. The copperstone phase and the adjoining part of the type along the lower mountain slopes are excellent soils for general farming and are also well adapted to fruit production.

The average crop yields of the entire area of Porters clay would be so misrepresentative of the different sections as to be valueless, and so are not given. This apparent discrepancy in the crop yields is due much less, however, to the natural productivity of the soil than to its management. Methods are far less intensive within the mountains than along the foot of them from Cashtown to York Springs, and thence to the northern extremity of the county, and crops yield accordingly. In the mountains the average yield of wheat is 14 bushels per acre, when it is not injured by the Hessian fly; rye, 12 bushels, and corn, 25 bushels. Grass generally grows short and thick, and the average yield of hay is three-fourths ton per acre. The lower portions along stream courses seem too cold for the production of good yields of hay. On the "copperstone" and adjoining areas the average yield of shelled corn is 40 bushels, wheat, 18 bushels, and hay, 1 ton per acre.

The following table shows the results of mechanical analyses of the fine earth of the soil and subsoil of this type:

Mechanical analyses of Porters clay.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
11562	Buchanan Valley	Brown clay loam, 0 to 10 inches.	5.2	7.3	3.0	4.7	3.2	47.1	29.5
11564	4 miles N. of Cashtown.	Brown heavy clay loam, 0 to 10 inches.	2.0	5.0	3.2	8.8	8.4	32.4	40.3
11563	Subsoil of 11562	Yellow clay loam, 10 to 36 inches.	4.2	6.5	2.6	4.8	3.2	48.0	30.7
11565	Subsoil of 11564	Yellow clay, 10 to 36 inches.	3.2	5.2	2.7	7.7	7.2	32.6	41.4

PORTERS STONY LOAM.

The surface soil of the Porters stony loam consists of light to heavy brown loam or occasionally clay loam, from 8 to 12 inches deep. The immediate subsoil is heavy loam, but with increasing depth this material grades into a clay loam which usually extends to a depth of 36 inches, though in places it is replaced by light-red clay at a depth of 30 inches. The stone content varies widely. The most level portions contain from 20 to 50 per cent of gneiss fragments, quartz conglomerate, etc., with but few large stones. The gneiss fragments are mostly small, and because of their presence this soil is usually termed "Mountain gravel land." The ridges and steep slopes are more stony than the areas just described, and the latter often lead to Rough stony land on higher slopes or the tops of hills and ridges. Numerous patches of Rock outcrop or Rough stony land are often found scattered about the steepest parts of the type. Along Green Ridge such areas occur as a strip along the crest, outcropping here and there in irregular series.

A lighter phase of this type occurs in several instances on hills and ridges, scattered about the true type. The soil consists of medium sandy loam to a depth of 8 inches, and contains from 30 to 70 per cent of stones. These stones are chiefly flaggy sandstones, with lesser amounts of quartzite. The principal part of the stones and bowlders which were formerly on the most level areas of this soil has been removed, and the content of small stones does not make tillage diffi-

cult. The subsoil is a heavy sandy loam, or loam underlain by clay loam at depths ranging probably from 24 to 36 inches, though it is seldom possible to bore to this depth on account of the high content of rock fragments. Areas of this nature would be mapped as Dekalb stony loam if their extent and manner of occurrence were such as to make this classification possible.

The Porters stony loam is found in the western and northwestern parts of the county, where it occurs either among the hills and ridges of the South Mountain Range or on some of the outliers of that range.

The topographic features of the type are much diversified. In general, its moderately or steeply rolling surface is much broken by many steep-sided hills and ridges, the tops and upper slopes of which have been mapped usually as Rough stony land.

Good surface drainage is provided for this type by its physiographic position, and in the steeper places the drainage is often excessive; slight washing results and crops are unable to withstand periods of drought.

The Porters stony loam is derived principally from the gneiss, orthofelsite, and quartz conglomerate rocks included in the South Mountain Range. The material resulting from this rock decay is largely in place on the more level positions, but on steep slopes the surface soil has been modified in varying degrees by the agencies of soil transportation.

The Porters stony loam seems eminently adapted to the production of apples and peaches, and several orchards have already been started. The trees thrive and fruit of excellent quality is produced. Freight rates to the nearest cities are so high, however, as seriously to interfere with the production of peaches on a large scale, and the steady spread of the San Jose scale will soon ruin the apple industry unless effective measures are used to combat this pest.

Fair yields of the general farm crops are obtained. Corn brings an average yield of 20 bushels, wheat 12 bushels, rye 12 bushels, and hay three-fourths of a ton per acre. The most stony and steepest places are often used as permanent pasture.

Small areas of very stony " copperstone land " have been included in this type. The soil texture of such areas exhibits no marked variation from the main part of the type. This phase is somewhat more productive than the rest of the type, but the better methods of cultivation which obtain upon it on account of its location have much to do with the greater yields.

The mechanical analyses of the fine earth of both soil and subsoil of the Porters stony loam are shown in the following table:

Mechanical analyses of Porters stony loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
11570	3 miles W. of Cash town.	Brown medium loam, 0 to 8 inches.	7.3	9.7	3.7	6.9	5.9	47.1	19.4
11572	2 miles W. of Cash-town	Brown clay loam, 0 to 8 inches	7.1	8.3	2.8	4.4	5.0	39.6	32.8
11571	Subsoil of 11570	Heavy yellow loam, 8 to 36 inches.	9.2	4.1	3.8	6.6	9.9	43.2	22.6
11573	Subsoil of 11572	Light clay loam to clay, 8 to 36 inches.	6.4	7.6	2.4	4.5	4.7	36.3	38.1

DEKALB STONY LOAM.

The surface soil of the Dekalb stony loam consists of brown, yellow, or gray medium sandy loam from 6 to 10 inches deep. The subsoil ranges from heavy yellow sandy loam to light-red clay loam, resting upon a mass of sandstone and quartzite fragments. The depth of the subsoil varies greatly. On the level portions of the area at the extreme northwest corner of the county it is often 36 inches or more deep, but in other places, and especially where the topography is more hilly, it seldom exceeds 24 inches, and is often much more shallow. From 25 to 50 per cent of rock fragments are scattered over the surface and mingled with the soil and the upper subsoil. These fragments are mostly flat, flaggy sandstones varying in diameter from 1 to 10 inches. There are few large stones, and these are usually found only on the steepest positions, where erosion has been rapid and the soil has been washed away in varying degree, leaving the underlying mass of rock fragments either exposed or near the surface. Depending largely upon the steepness of position and the extent to which consequent erosion has taken place, thereby augmenting the stone content of the soil, the Dekalb stony loam generally grades into or is bounded abruptly by the area mapped as Rough stony land. The most important area of the Dekalb stony loam is found in the extreme northwest corner of the county, where it occupies a small table-land and part of the escarpment leading to it with some steeply rolling land adjoining. Another area lies along the mountain streams—Conococheague Creek and Birch Run—occupying the valleys of these streams and the foothills and lower mountain

slopes on each side. A third area is found on Pine Hill, and several scattering areas occur in the Pigeon Hills of Berwick Township.

The drainage of the Dekalb stony loam is always sufficient, except on small level areas adjacent to Conococheague Creek, which are subject to overflow in times of freshet. The open texture of much of the type and the underlying masses of rock fragments render the soil unretentive of moisture, and crops can not withstand any considerable period of drought, but on the area known as "the flats" the clay loam subsoil is deeper than elsewhere and crops do not suffer in seasons of normal rainfall.

The Dekalb stony loam is derived from quartzite, quartzose sandstone, and conglomerate, Potsdam and Azoic in age. The quartz particles in these rocks are very firmly cemented together, and consequently they break up slowly.

On the area of the Dekalb stony loam known as "the flats" fair yields of rye, oats, wheat, and corn may be produced, if the soil is carefully managed, but it will be difficult to meet the competition of better soils. Several peach orchards have been started on this area, and where the land is in such condition that the cost of starting an orchard is not too great this industry undoubtedly offers opportunities for profitable development. Potatoes might be grown profitably on the more level fields which are not too stony. The greater part of the type is left in forest, and, with the exception of the most level places, which are underlain by a heavy subsoil and are not so stony as to be troublesome in working, this is the best use to which it can be put. As managed at present, the crops are planted mostly in young peach orchards or else in scattered areas, and in either case the yields are low.

The following table shows the results of mechanical analyses of the fine earth of samples of both soil and subsoil of this type:

Mechanical analyses of Dekalb stony loam.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
11592	Near NW. corner of Adams County.	Brown sandy loam, 0 to 8 inches.	5.2	22.4	12.2	23.9	5.9	19.0	11.2
11594	1 mile W. of Mountain Creek.	Light sandy loam, 0 to 6 inches	7.3	15.7	12.8	20.8	5.0	18.4	19.9
11595	Subsoil of 11594	Heavy sandy loam, 6 to 36 inches.	5.8	22.8	14.6	22.4	5.5	15.6	13.3
11593	Subsoil of 11592	Yellow sandy clay, 8 to 36 inches	10.2	15.8	11.5	17.4	4.1	11.9	28.7

ROUGH STONY LAND.

Areas which in the main are too rough and stony to be included in either of the types of stony loam have been indicated on the map by symbol. Such areas often contain spots here and there of mere rock outcrop, but the type as a whole is not sufficiently stony to be so classified.

Large areas of Rough stony land are found in the South Mountain Range, and small areas occur along the intrusive dikes which traverse the county. In the former position such areas are associated usually with the Porters stony loam and in the latter position with the Cecil stony loam.

The principal part of the Rough stony land is left in forest. The original timber growth has been cut from most of it, and a scrubby second growth has sprung up. Forest fires have spread over large tracts, and the appearance of such areas is desolate in the extreme. The State government has acquired a great quantity of this land along the western side of the county at a uniform price of $3.50 an acre. Such areas will be kept as a forest preserve, and forest warders are now stationed there to care for the property. That the State has taken up the matter is most fortunate, for otherwise there would be little opportunity for the growth of timber in the face of extensive forest fires, such as were common when no one was responsible, and of the ruthless destruction by chance tree cutters.

Small areas of the Rough stony land which adjoin farms in various parts of the county are utilized to some extent for pasturage, and the best parts of the type when conveniently located near better land may be used to advantage for this purpose. On South Mountain small houses are sometimes seen on cleared patches of this type, ranging in size from one-half of an acre to 3 or 4 acres, and some attempt is made toward tillage, but this represents a condition of circumstances rather than soil adaptation.

MEADOW.

The surface soil of Meadow, to an average depth of 9 inches, consists of heavy gray, drab, or light-brown clay or clay loam. The soil is fine and free from grit, and in places the silt is quite noticeable. The subsoil, to a depth of 36 inches, is a gray, mottled-yellow, or drab clay, and below 3 feet the clay content generally increases and the soil becomes more plastic.

Meadow occurs in the Conewago Valley and in Carroll's tract as low-lying land adjacent to stream courses and the lower slopes adjoining. From its topographic position much of the type may appear as valley land, yet its boundaries with the adjoining Hagerstown loam, which is elevated slightly above it, are not often sharply

marked, and its physiographic features for the most part may be said to be included in a very shallow trough. It also occupies depressions in the uplands about the head of streams, as well as low-lying, narrow areas along stream courses.

On this type of soil the drainage is generally deficient. Surface drainage on the slopes back from the streams is adequate, but near the streams overflows are more or less frequent, and in very wet seasons considerable damage is done to crops. Tile drains in some places would afford adequate drainage.

This soil is derived in part from the decomposition of the underlying limestone, and also from the fine material washed from the adjoining types of soil.

With proper drainage the Meadow is well adapted to hay and wheat, and in a less degree to corn. Where cultivated, the average crop yields are as follows: Corn, 35 bushels; wheat, 15 bushels, and hay, 1½ tons per acre. A considerable proportion of the type is used for pasturage and is best adapted to this purpose.

The following table shows the results of mechanical analyses of the soil and subsoil of this type:

Mechanical analyses of Meadow.

No.	Locality.	Description.	Fine gravel, 2 to 1 mm	Coarse sand, 1 to 0.5 mm.	Medium sand 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P ct	*P ct*	*P ct.*	*P ct.*	*P. ct*	*P ct*	*P ct.*
11608	1 mile N. of Arendtsville.	Light clay loam, 0 to 6 inches.	0.5	1.2	0.7	1 7	2.9	59.9	33.0
11610	3 miles N. of Hunterstown.	Brown clay loam, 0 to 8 inches.	4	2.0	1.2	3 3	4 0	52 9	36.2
11604	3 miles NE. of Littlestown.	Heavy clay, 0 to 9 inches..	.8	1.8	1.1	3.4	4.0	30 7	58.0
11606	1¼ miles W. of Mc Sherrystown.	Heavy clay, 0 to 10 inches.	2	2.6	1.7	4.0	2 5	30.4	58.6
11611	Subsoil of 11610.....	Heavy clay loam, 8 to 36 inches.	2 6	4.1	.9	2 5	5.1	52 9	31.5
11609	Subsoil of 11608.....	Gray clay, 6 to 36 inches..	1.4	3.1	1.5	3 6	3.4	44.2	42.5
11605	Subsoil of 11604.....	Gray clay, 9 to 36 inches..	1.4	2 4	1 4	3.4	3.0	41.5	47.3
11607	Subsoil of 11606.....	Clay, 10 to 36 inches.....	Tr	1.4	8	3 0	4.0	42.6	48 3

AGRICULTURAL METHODS.

The agricultural methods in use in Adams County are, in general, very well adapted to the extensive system of farming which prevails, but there is little evidence of the adoption of more intensive methods to meet the changed conditions and the more active competition of

the last few years. The rapid increase in the number of farms rented during the last fifteen years is in larger measure responsible for this, for the inclination is strong, as is but natural, for the owners to expect the same methods of management to be followed by tenants which they themselves have pursued with success in years gone by; and there is thus little opportunity for tenants, if, indeed, there is much inclination, to undertake any innovation in farming methods.

The methods of cultivation are fairly efficient in that the plowing is, in the average case, well done, but on the other hand the further preparation of the seed bed is generally inadequate. Corn is now planted largely with check-row drills, which allow the crop to be cultivated both ways, and it is well worked during the early part of the season. Little hand hoeing is done, but a few farmers hoe their corn once. The corn crop is harvested early, in many cases, to allow the drilling of wheat. This involves a good deal of labor, as it is necessary to haul the fodder from the field before it is sufficiently cured for storage in barns, and it is usually stacked along the fences on all sides of the field after the corn is husked.

Farmers are well supplied with grain drills and modern harvesting machinery. Corn binders are rapidly coming into use, but the scarcity of hay tedders is surprising; and hay loaders are rare, though they might be used to advantage on large areas in the county.

Stable manure is carefully saved by painstaking farmers, but there are many careless exceptions. The manure is hauled to the fields twice a year, the comparatively small amount made during the summer being used in the fall for wheat, while that made during the remainder of the year is used in the spring for corn. Large quantities of low-grade commercial fertilizer are bought at a rate of from $11 to $16 a ton, and a few farmers use higher grades, which range in price from $18 to $23 a ton. The fertilizer is used for wheat at an average rate of 200 pounds to the acre, unless a light dressing of stable manure is used, when the amount is somewhat less. Corn is fertilized in a similar way, but the amounts used are, as a rule, somewhat less than for wheat. A dressing of 100 pounds an acre is also commonly applied for oats. The amount of fertilizer applied varies but little, though the grade thereof may vary much. In some sections in the western part of the county, on the Porters stony loam and the Porters clay, there is practically no manure or commercial fertilizer applied to corn, as it is deemed sufficient to plow under the sod of the preceding hay crop, especially if this be of clover. Considerable lime is burned in the limestone districts of the county, and the practice of applying lime to each field once in the course of several years still prevails, though to less extent than a few years ago.

Systems of crop rotation are in general use. The most common

sequence is corn, oats, wheat, and grass. This rotation is varied somewhat by omitting oats altogether, since the rust has been so troublesome, and growing wheat two years in succession, or by substituting rye for the second crop of wheat. The general plan is to cut hay either one or two years, but fields are occasionally left in grass for several years and then pastured for a year or more.

AGRICULTURAL CONDITIONS.

The prosperity of the farming class of Adams County bears a close relation to the soil types upon which the farms are located. Farms situated on the limestone soils, the Penn loam, the least shaly parts of the Penn shale loam, and the copperstone phase of the Porters clay have, in most cases, the appearance of prosperity, while on the other soils the prosperous farmers constitute a minority. It is said that fifteen years or more ago the majority of the farmers were prosperous, and many became well to do; but since that time the profits have greatly diminished until the last two or three years, when there has been a slight tendency toward improvement of conditions.

The ownership of farms also has much to do with the prosperity of local agriculturists. The best farmers, who live on and till their own land, are notably thrifty, and by dint of rigid economy and remarkably long working hours for themselves and families secure a good rate of interest on their investment besides the living expenses of the family. Men who rent their farms seldom get a rate of interest on their investment equivalent to that paid by savings banks, and only an occasional tenant has anything left after paying the living expenses of himself and family.

The ratio of the number of farms occupied and tilled by the owners to the number of those worked by tenants is quite variable, not only in different parts of the county, but also in sections near together. If the county be considered as a whole, the estimate that 50 per cent of the farms are rented is probably safe. This ratio varies, however, within wide limits, and as given for many sections ranges from 25 to 75 per cent. Practically all of the renting is done under the share system. By the arrangement most common under this method, the tenant furnishes the labor, stock, tools, one-half of the seed, one-half of the commercial fertilizers, and pays one-half of the taxes, and receives one-half of all produce. If the owner furnishes the stock and tools, the tenant receives as his share one-third of the produce. In a few cases the owner furnishes everything and pays a stated salary to the tenant in addition to a partial interest in the crops. In some cases the tenant is required to furnish two-thirds of the commercial fertilizers, but in other cases only one-third, and in general there are many minor deviations from the above rules to fit

special cases. The acreage of crops to be grown is stipulated in the agreement. The amount of stock to be kept by the tenant is also stipulated, and the owner usually takes care that the amount is sufficient to require that most of the tenant's half of stock feed shall be consumed on the farm. In other cases, where the stock is partially fed from undivided produce, the amount of stock to be kept is limited by the owner. The length of time which tenants occupy the same farm is exceedingly variable. In the limestone valley the average period is possibly as long as five years, and in rare cases farms are worked by the same tenant for fifteen or more years, but the number of tenants who stay on the same farm only one or two years is very large, and this makes the average for the county low. Of the real estate of the county probably three-fourths is unincumbered, and of the remaining one-fourth the average incumbrance is presumably less than 25 per cent of the value of the property.

Farms on the limestone soils range in size from 60 to 200 acres, with an average of about 125 acres. On the Penn and Cecil series of soils there are more small farms of from 40 to 60 acres each, and so, although farms of 200 acres are not uncommon, the average size is probably not over 90 acres. On the mountain areas the farms are smaller, the average being not far from 65 acres.

The farm buildings and improvements on the best soil types are, as a rule, excellent, and with the exception only of the poorest mountain districts and certain areas along the trap ridges they are good. The barns are large and substantial. The lower story is usually built of stone or brick and the superstructure of wood.

The dwellings are commodious and well built. Many are of stone obtained from the trap ridges. Bricks manufactured in the county are also extensively used in some sections. Both the dwellings and the barns are kept well painted and in good repair.

The prices of land range from $3.50—the price paid by the State for forest preserve in the mountains—to $125 an acre for well-improved limestone farms. There are considerable areas along the trap ridges and in the hilly or mountainous districts valued at from $10 to $20 an acre. Well-improved farms on the Penn loam are worth $30 to $60 an acre, and farms with similar improvements on the Penn shale loam are worth from $20 to $45 an acre.

The farm laborers hired in the area are nearly all natives of Adams or some adjoining county, and consequently are generally efficient for the work to be done. The only time when there is any scarcity of laborers is for short periods while crops are being harvested. During the harvest season day laborers receive $1.25 a day and board, but at other times during the summer from 75 cents to $1 a day. Good men

receive $16 a month and board, for eight or nine months of the year. This decreases according to the efficiency of the workmen to $8 a month with board. In the winter season these laborers work for their board, go to the city, or wait for the next spring to appear.

The principal products of Adams County are wheat, hay, corn, and beef cattle. The secondary products are oats, apples, peaches, potatoes, hogs, sheep, poultry, and crops for the canning factory. The relative importance of these farm products varies in different parts of the county and fluctuates to a considerable degree in every section. Wheat, which has been the chief money crop for many decades, still maintains that important position, and in acreage far exceeds any other crop save hay. Local flour mills grind the principal part of the wheat needed for local consumption. The straw, at the time of thrashing, is stacked in large piles in the barnyards. There cattle utilize a part of it as roughage and the rest is trampled with the manure.

Nearly all farmers sell some hay, and many sell large quantities of it, while a few, discouraged by the low prices of wheat in former years, depend upon it as the principal money crop. Corn is the crop of next importance, and many sell the greater part of their yield. Others buy 2 and 3 year old steers, which are brought to the county, principally from Virginia, by drovers. This plan is pursued by many for the sake of having stable manure with which to maintain the fertility of their farm lands. As long as this was profitable farmers were glad to follow this plan, and to have the manure in return for their winter's labor, but the failure to realize anything, or but a nominal return, for the corn crop when thus disposed of has led many to stop buying steers, and to sell their corn. The desire to maintain the fertility of the soil, however, prompts nearly one-half of the farmers to take the risk and fatten from 3 to 15 steers each winter.

The greater part of the milk is hauled to skimming stations located at or near railway stations, and sold by the Babcock test to the operators of proprietary creameries. The cream is then shipped to cities for retail trade, or to a creamery outside of the county, where it is made into butter. Other small proprietary creameries are located within the county. Nearly one-half of the farmers make butter at home and dispose of it at the local stores at a very low average price. A few enterprising farmers, by producing a superior grade of butter, have effected a steady sale of their products to dealers in Philadelphia at satisfactory prices. This method, though limited in scope, affords probably the most remunerative disposition of dairy products in the county, and illustrates an opportunity of which those who understand how to make an excellent product might well avail them-

selves. The inauguration of cooperative creameries among farmers offers also a solution for the satisfactory manufacture and sale of dairy products. This system has proved eminently successful in some parts of the country, and would seem to be worth while in Adams County, where the dairy industry is poorly developed chiefly because of the unsatisfactory returns for its products. A marked improvement in the standard of herds would be essential, however, before the dairy industry could be very profitable.

Oats were formerly an important crop and were used in almost every rotation, but the uncertainty of the yield in recent years, particularly on account of the rust and the consequent inferiority in quality, has greatly reduced the production of this crop. Small quantities of barley are also grown.

Large quantities of apples are grown along the foot of South Mountain near Cashtown and from there toward Bendersville. The fruit has been of excellent quality and gave promise of the extensive development of the industry in that section, but the scale has already obtained a strong foothold in some of the orchards, and unless this pest be combated by the use of sprays and washes the extension of the apple industry is seriously threatened.

Peach orchards are scattered all over the county, and if good markets were more accessible, or if adequate shipping facilities could be introduced for the proper transfer of this fruit to market, its production would be increased and attended with profit. Under the present market conditions the crop is generally considered unprofitable.

Many small flocks of sheep are seen, but the number seems to be decreasing. Nearly every farmer sells a few hogs each year, and some have made this an important adjunct to their other farming operations. Others derive a considerable income from poultry.

A canning factory at Littlestown uses the sweet corn obtained from 600 to 800 acres grown in this county, and also a few peas and beans, but the most of the latter products canned are obtained below the Maryland line. In many places in the vicinity of farm dwellings the roads are lined with sweet cherry trees. These bear abundantly, but there is practically no market for them, and those not utilized at home mostly go to waste.

The adaptation of soils to crops receives almost no attention throughout the county, and, with the exception of the care used in the selection of soil for growing potatoes, and in some instances for fruit, the same crops are grown on all soils, unless the conditions of drainage in certain areas seriously interfere.

The transportation facilities of the county are not adequate for the full development of its agricultural interests. The Western Maryland Railway crosses the county from east to west, connecting it with

Baltimore and Philadelphia, and the Gettysburg and Harrisburg Railway extends from the center of the county north to Harrisburg. The Frederick branch of the Northern Central Railway crosses the southeastern corner of the area, connecting Frederick, Md., with York, Pa. Large areas in the county are thus left a long distance—6 to 12 miles—from a shipping point. No important electric lines have been built. A short line has been constructed at Gettysburg, so as to include that part of the battlefield most interesting to visitors, and a still shorter line connects McSherrystown with Hanover, in York County, a distance of 2 miles. Several toll turnpike roads cross the county, and although these are an advantage when the mud is deep, they are so rough during the summer season that the common dirt roads are preferable.

Baltimore and Philadelphia are the principal markets, the former receiving the greater part of the grain, hay, and cattle, while the latter is the best market for fruit, butter, and poultry.

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U. S. DEPT. OF AGRICULTURE
BUREAU OF SOILS
MILTON WHITNEY, CHIEF

SOIL MAP

PENNSYLVANIA
ADAMS COUNTY SHEET

SOIL PROFILE
(3 feet deep)

- Hagerstown stony loam — Sc st / Scc st
- Hagerstown loam — Scc / C
- Penn sandy loam — Ssc / Sc
- Penn loam — Sc / Scc
- Penn shale loam — Sc / Sc
- Cecil stony loam — Sc st / Scc st
- Cecil loam — Scc / Scc
- Cecil clay loam — Scc / C
- Porters stony loam — Sc st / Scc st
- Porters clay — Scc / C
- Dekalb stony loam — Ssc st / Ssc st
- Cardiff slate loam — Scc / C

LEGEND

Sc Loam
Scc Clay loam
Ssc Sandy loam
C Clay
Sc st Stony loam
Scc st Stony clay loam
Ssc st Stony sandy loam
Sc st Shale loam

LEGEND

- Hs — Hagerstown stony loam
- Hl — Hagerstown loam
- Psl — Penn sandy loam
- P — Penn loam
- Pl — Penn shale loam
- Cs — Cecil stony loam
- Cl — Cecil loam
- Cc — Cecil clay loam
- Ps — Porters stony loam
- Pc — Porters clay
- Dl — Dekalb stony loam
- Csl — Cardiff slate loam
- Rs — Rough stony land
- M — Meadow

Idaville · York Springs · Bendersville · Floradale · Center Mills · Heidlersburg · Biglerville · Arendtsville · Beechersville · Berlin · Hampton · Abbottstown · Hilltown · Cashtown · Mummasburg · Mc. Knightstown · Hunterstown · Newchester · New Oxford · Irishtown · Mc. Sherrystown · Bonneauville · Two Taverns · Littlestown · Fairfield · GETTYSBURG · BATTLEFIELD

Conewago Creek · Opossum Creek · Birch Run · Conocheague Creek · Mountain Creek · Marsh Creek · Willoughby Run · Rock Creek · Little Flat Run · Alloway Creek · Mud Run · Plum Run

BOUNDARY LINE · CUMBERLAND CO. ADAMS CO. · YORK CO. ADAMS CO. · FRANKLIN CO. ADAMS CO. · FREDERICK CO. ADAMS CO. · MARYLAND PENNSYLVANIA BOUNDARY LINE · CARROLL CO. ADAMS CO. · MARYLAND PENNSYLVANIA BOUNDARY LINE

WESTERN MARYLAND R. R. · GETTYSBURG AND HARRISBURG R. R. · NORTHERN CENTRAL R. R.

Soils surveyed by
Henry J. Wilder and H. L. Belden
1904

Scale 1 inch = 1 mile

Field Operations
Bureau of Soils
1904